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ABSTRACT

Existing research indicates that particular study strategies are deployed with differing success according to certain critical personality factors, most notably a syndrome of characteristics related to internal or external locus of control. Institutional factors that have an effect on study behavior include Faculty membership (Arts/Science), mode of evaluation (Objective/Essay), and method of combining marks for final grade. The interaction between personality and environmental factors is, however, rather complex and no easy generalizations can be drawn, beyond saying that academic success is not achieved by any single study strategy; good students work effectively in quite diverse but characteristic ways. In particular, two effective strategies involve, first, acceptance of academic study for its own sake, with emphasis upon wide reading, integration and meaningful learning; and second, academic study as a means, with a cool non-nuerotic and highly organized approach to course work. An 80-item Study Process Questionnaire (SPQ) has been produced, and the author is interested in extending its use in research and in obtaining norms for Australian students. (Author)

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Individual and group differences in study processes

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Theoretical rationale

For many years, student study processes have been studied in the context of an independent variable in the prediction of academic performance. Most of this work has proceeded on the simplest of nomothetic assumptions that there are "good" study habits and attitudes that, if adopted, would boost the performance of most students. Such work ranged from the trivial (reciting vs. not reciting; Gates, 1917) to the cosmic, the latter perhaps reaching its peak in Robinson's (1961) advocacy of "the Australian crawl of study methods", SQ3R.

It is true that study methods can be shown to relate to academic performance at tertiary level, after IQ, prior knowledge of the subject area, SES and other independent variables (Lavin, 1965), but the amount of variance thus accounted for is relatively small, and even that is hedged around with many ifs and buts. Lafitte (1963) found that the good student often did not waste his time on "good" study habits; and to complement the picture, Maddox (1963) found that poor students often had the most impeccable study methods. Entwistle, Nisbet, Entwistle and Cowell (1971) conclude from their work that the common assumption that "all successful students will follow the same path to success" (p.265) is simply false.

A more complex model is needed. Study processes -- and this term is meant to include a complex of tactics, strategies and approaches that are in turn dictated by relevant values and attitudes -- is conceived here as a set of variables moderating between determining factors and final academic performance. This suggestion immediately opens out a field of research in which one would look at the determinants of study behaviour: to treat it as a dependent variable for a change.

Following the Lewinian model that behaviour is an interactive function of the person and of the environment, two classes of determinants

suggest themselves:

1. Personological: e.g. personality factors, IQ, home background.
2. Institutional: e.g. subject area studied, teaching method, evaluation mode:

Performance is then presumed to be affected by personality and environmental factors via the study process: complex. It has been known for a long time, for example, that personality factors predict academic performance to a small but significant extent (even using the simplest univariate linear model): the present model suggests that such relationships are mediated by this complex of values and attitudes which in turn determine the processing of academic information.

The situation may be depicted as a within-the-skin variant of the presage-process-product paradigm of the classroom interaction researchers:

Figure 1 goes here

Three broad areas of enquiry remain:

1. To define the study process complex, independently of the presage domain;
2. To relate the process domain to the presage domain;
3. To relate the process domain to performance.

Progress to date relates mainly to (1), but with some work in areas (2) and (3).

Defining the process domain

It was decided at the outset to use a pencil and paper self-report questionnaire in a Likert format as a means of operationalizing the study process domain. Originally, the domain was limited to behavioural manifestations of academic information processing, and hence the title of the first and ensuing instruments, "Study Behaviour Questionnaire"

and the reference in the abstract and original title of this paper. However, this is something of a misnomer in that values, attitudes and motives concerning study elbowed their way in very early in the research. To avoid ambiguity, I now refer to study processes, rather than study behaviours, and to the instrument as the Study Process Questionnaire (SPQ).

The items were for the most part written as presumed operationalizations of those personality variables that a search of the literature indicated might be relevant to approaches to academic studying. The work of Hudson (1966) was particularly relevant here, who showed that at undergraduate levels divergently biased individuals preferred Arts and convergently biased Science. Other variables included intolerance of ambiguity (Frenkel Brunswik, 1959), dogmatism (Rokeach, 1960), and cognitive complexity (Schroder, Driver and Streufert, 1967). For instance, intolerance of ambiguity was operationalized "I find it confusing when lecturer emphasize that a particular theory is only tentative and must be understood as such"; cognitive complexity, "I try to relate what I have learned in one subject to that in another"; and dogmatism, "I believe that it is useful to assume that nothing is ever certain or proved". Such items, together with a general Study Skills set of items, e.g. "I work out in advance what my study schedule will be and then try and keep to it under all circumstances", were thrown together and administered to over 300 first year students entering Monash University in 1967. The data were factor analyzed and six factors extracted, roughly approximating to those intended (Biggs, 1970a). This sample also completed a battery of personality and reading performance tests, and their matriculation and final performance in first year were known. These data were then inter-correlated with factor scores on the six study behaviour dimensions (Biggs, 1970b). The

results were consistent with the notions that the study behaviour items were academic manifestations of certain basic personality characteristics, and that these manifestations mediated relationships to performance. However, it was also clear that these relationships differed between the faculties of Arts and Science, and that some of the dimensions of the study process domain particularly on the issue of the relevance of value/attitude factor needed to be relabelled. Subsequent studies, to be referred to in more detail later, have suggested a slightly different interpretation of this or that dimension.

The present situation is that the SPQ has ten unidimensional scales as follows: (the first set of Cronbach alphas were computed on a 1975 Australian sample of 150 Dip. Ed. students. In fact, these alphas are slightly higher than those obtained on a Canadian sample of 350 first year students; with only marginal differences in the means and SDs. The second alphas were obtained from a Canadian High School sample in the HS version (Richmond, 1972))

Table 1 goes here

The High School version of the SPQ is similar, consisting of nine scales, reworded to suit the school situation ("teacher" for "lecturer", "discussion" for "seminar", etc.) and the deletion of the openness scale. This version is currently being adapted for use in Australian High schools, but no data are available at this time.

These ten dimensions, then, are the ones that have evolved so far. Undoubtedly other dimensions could be suggested, but there is obviously pressure to minimise the total number of scales in order to balance scale reliability against the total number of items.

1. Pragmatism (10 items; $\alpha = .77; .70$): Grade-oriented; student sees university qualifications as a means to some other end.
2. Academic motivation (10 items; $\alpha = .69; .69$): Intrinsically motivated; sees university study as an end in itself.
3. Academic neuroticism (7 items; $\alpha = .58; .64$): Overwhelmed and confused by demands of course work.
4. Internality (8 items; $\alpha = .54; .55$): Uses internal, self-determined standards of truth not external authority.
5. Study skills (8 items; $\alpha = .70; .76$): Works consistently, reviews regularly, schedules work.
6. Rote learning (8 items; $\alpha = .70; .61$): Centres on facts and details and rote learns them.
7. Meaningful learning (8 items; $\alpha = .71; .67$): Reads widely and relates material to what is already known; oriented to understand all input material.
8. Test anxiety (6 items; $\alpha = .82; .74$): Worries about tests, exams, fear of failure.
9. Openness (8 items; $\alpha = .63; -$): Student sees university as a place where values are questioned.
10. Class dependence (7 items; $\alpha = .50; .47$): Needs class structure; rarely questions lecturers or texts.

Table 1: Original SPQ Scales (full listing in Appendix A)

Presage-process relationships

(a) Personological

The original six scales were correlated with several marker variables, as reported earlier. These relationships were interpreted as indicating that stable patterns of study behaviour form the phenotypes of underlying genotypic personality variables. Of course, such an interpretation is not the only one, particularly on the basis of a correlational analysis. Another aspect to this study process style and personality relationship was indicated in another study by Biggs and Das (1973).

The point of departure in this study, oddly enough, was the interpretation of the tendency to score extreme points on a rating scale such as a Likert item. In the 1970b study, Biggs found that those who tended to check the '1' and '5' positions on the Dogmatism scale were divergent, low on dogmatism itself, tolerant of ambiguity, intrinsically motivated, and more likely to be enrolled in Arts than Science. This finding was compatible with that of Katz, Katz and Olphert (1965) but is totally inconsistent with the traditional interpretation of extreme scoring, which is that it indicates low intelligence, rigidity, and intolerance of ambiguity (e.g. Souleff, 1958; Das and Dutta, 1969). Accordingly, Das and I agreed to include some extra tests that might throw some light on this contradiction in a battery of tests to be administered to three Educational Psychology classes involved in current SPQ research. The Rokeach Dogmatism (D) scale was the instrument used to assess the adaptive kind of extreme response set (ERS), as in the earlier Biggs and Katz et al studies; the Personal Friends Questionnaire (PFQ) that for determining maladaptive ERS. The latter instrument requires Likert judgements to be made to 70 adjectives desirable in a friend. In addition, ERS was assessed on the (then) SBQ itself. All scales used a 5-point Likert format.

The three ERS measures reduced to two orthogonal dimensions, ERS-D and ERS-SBQ defining one dimension, the ERS-PFQ the other. The first factor, labelled ERS-I, appears to reflect the intensity of the individual's beliefs about internal data, i.e. his reflections upon his own academic values and practices and his ideological beliefs and attitudes; while the second, labelled ERS-E, reflects the intensity of attitudes towards external data, i.e. the attributes of friends. A series of correlations and analyses of variance, involving the remaining tests in the battery with the two ERS measures as dependent variables, showed that high ERS-I scorers tended to be introverted, divergent, non-dogmatic (open), to use meaningful learning strategies and to avoid rote learning. Highest ERS-I was found in those low dogmatic subjects who had high response latencies, i.e. who took their time to respond. High ERS-E subjects tended to be extraverted, dogmatic, to favour rote learning strategies, to obtain good essay ratings but low scores on an objective test requiring a high degree of inference. Highest ERS-E was found in extraverts who avoided a meaningful learning strategy. Interestingly, there were no differences between ERS-I and ERS-E in final grade for the course; no sex differences were found at any stage.

If need for certainty is the genotype underlying ERS (Damarin and Messick, 1965), it appears that the high ERS-I scorer obtains certainty by organizing and integrating his ideas, the high ERS-E scorer by giving socially acceptable responses, and rote learning academic data instead of incorporating it into cognitive structure. These two pictures are strongly reminiscent of Jensen's (1970) descriptions of Level II and Level I processes. It was concluded that ERS "may be an index of the manner in which a person orients himself in relation to the external worlds" -- and more to the present point -- "this orientation may be predictive of his approach to academic learning tasks" (Biggs and Das, 1973; p. 208).

This study has been described at some length because it appears to tie two very important study strategies, meaningful and rote learning, to a basic genotype in personality structure concerning the life style or stance a person may adopt towards the self, other persons and the external world, that of internality-externality (Gardner and Moriarty, 1968). While this stance, as such, bears little relationship to academic performance, it is seen here that it is moderated, in a consistent way, by study process variables, which do relate to academic outcomes.

Some work has been done on home background factors (Biggs, 1972), and these will be reported briefly. A high school version of the earlier SBQ was administered to 400 boys in Melbourne sixth forms and some home background and performance data were available. Sons of Catholics, Jews and Other Non-Christians (Asians) tended to adopt meaningful learning more significantly than did C. of E., Other Christian and No Religion, and likewise for sons of fathers with primary education only. It is likely that these data reflect a relationship with low SES or immigrant parents: the schools were highly competitive, only the most academically oriented staying on to matriculation. Another finding, probably not due to selectivity, was that sons of fathers with Teachers College certificates were outstandingly the most academically neurotic! Clearly the precise relationship between home background and study process requires further work.

(b) Institutional

The next set of relationships between study process variables and presage variables refers to procedures adopted in the educational institution, i.e. relating to the subject area studied, teaching method and mode of evaluation. Little work has been done so far on teaching method, but there are findings with respect to the remaining two.

(i) Subject Area

It seems a priori likely that effective study processes would differ according to the nature of the subject matter studied. One of the more obvious differences between Arts and Science subjects at first year university level is that the latter build upon a structure of knowledge that is already quite familiar, while the former are for the most part (foreign languages being a major exception) relatively unfamiliar. A further difference is that Arts material is usually more loosely structured, whereas in Science there is much less freedom for legitimate individual interpretation (at this level).

Accordingly, it was expected that prior knowledge (matriculation performance) would be the best and possibly only predictor of first year Science performance, but in Arts it was expected that the student could either rely upon a rote learning strategy, focussing upon specified course content and avoiding complexity (as a Level I externaliser); or he could read widely and provide his own interpretive structure, as a good Level II internaliser. These expectations were in general borne out in the 1970a study.

These results were not however replicated in a Canadian sample (Biggs, 1976), nor by Goldman and Warren (1973) at a Californian university. In both these latter studies the same two basic strategies of meaningful and rote learning were distinguished but they were used by individuals with equal success whatever the content area. This difference could reflect differences between North American and Australian curricula, or it could refer to other institutional factors such as teaching method or evaluation differences.

(ii) Evaluation modes

A major issue in the evaluation of academic performance is that concerning essay versus objective tests. We are not concerned here with issues of validity and reliability but with the extent to which different

modes of testing favour students using different study processes. There is a common belief amongst academics that they do; Adams (1964), for instance, says that "the essay stimulates use of superior study methods in preparation (but) objective tests may stimulate superficial learning of many details" (p. 330-1). Hakstian (1971), however, concluded that students do not prepare differently for one as opposed to the other format, and that the essay does not call upon higher cognitive processes than does the objective test.

In a study on this problem (Biggs, 1973), five tests to assess course content in Ed. Psych. were administered to two parallel classes: two objective tests, two essays, and one ambiguous (short answer), together with the SBQ. The tests were factored analysed, and very conveniently, a varimax rotation produced three orthogonal factors: general achievement (format-free), objective format and essay format. A series of analyses of variance were carried out, using the SBQ factors as independent and factor scores on the three performance factors as the dependent variables.

1. Format-free performance. A similar picture to that already mentioned emerges. High performance, however assessed, may be achieved in one of two ways: (i) a meaningful learning strategy, whereby the student reads widely and integrates his reading; or (ii) a "minimax" strategy, dictated by pragmatic values (university as means to an end), involving a rote learning approach to all class prescribed material but no other, with accompanying self-set work schedules. It must be noted that these two approaches apply to both essay and objective examinations. Academic neurotic students did poorly, whatever the format.

2. Objective-unique. In addition, pragmatism, rote learning and class dependence exerted further effects on the objective format score. The student who knows where he is going, focusses upon and rote learns

significant detail, programmes his work minutely and follows the lecturer's lead closely will score a bonus if assessment is by objective test. This is really not surprising: such a combination describes the high converger, who is frequently defined operationally as the one who scores particularly well in the "one correct answer" format.

3. Essay-unique. Two styles emerged here as likely to achieve particularly high essay ratings: (i) balancing extent of relating several issues with degree of interest in those issues, i.e. it is better to take few issues and go into them deeply if you are involved, but if not, it is better to relate up a number of issues; (ii) rote learning and strong class and teacher dependence produce high essay grades: this is referred to as a "give-teacher-what-he-wants" strategy.

The evidence here, then, indicates that the best of most "academic" study strategy processes can be invoked whatever the means of evaluation. Beyond that, objective tests favour convergers -- so that if that was the only mode of evaluation, high convergers would end up with higher grades than low convergers -- and essays favour opportunists who capitalise on perceived prejudices of the teacher. This possibly says as much about the teacher as about the format of essay, but it is interesting that this finding is consistent with that in the Biggs and Das study, where externalisers (equivalent to the opportunist) got good essay grades. One practical implication of this work is that evaluation should proceed by both formats, if the lecturer does not wish to optimize the chances either of high convergers or of opportunists.

A second issue that has been studied concerns the method of combining marks in a course to achieve a final grade (Biggs and Braun, 1972). Two common procedures are: (i) the union model, in which the marks from Test A, Test B, Test C etc. are added, i.e. the student has to be good at essays and objective and practicum, etc. and (ii) the disjunction

model, in which the best mark is taken from Test A, Test B, etc., i.e. the student has to be good at one of several alternative things. The question is: does the use of one or other model favour a particular kind of student, in terms of his academic values or study processes? On the basis of this study, the answer was "yes": four student characteristics uniquely discriminated the two models. The union model favours students who are class oriented and teacher-dependent, who systematically schedule private work sessions, and who rote learn significant detail but who nevertheless try to interrelate their work, while the disjunction model selects against such students. The difference here is in "quantity coping" strategies and makes clear sense. Remembering that both models favour relating, wide reading and academic interest, and that neurotics do poorly under both, if the lecturer wishes to favour "quantity copers" then he should use a union model, but if he wishes to favour the "loner" who does his own thing in depth, then he would use a disjunction model. These findings were based on habitual student study processes: the picture would likely have been clearer still if students had been warned in advance, and had opted for one or other of the models.

Process-product relationships

The relationships between study process variables and academic performance have already been alluded to in the studies summarised above. There are in fact few dimensions of study process that have strong main effects on performance, i.e. that relate unilaterally to performance. The ubiquitous study skills dimension (scheduling private study sessions, keeping up to date with assignments, etc.) emerged most strongly in a high school population (Biggs, 1972), accounting for 10% of the variance of performance scores, and in a

Canadian Science students (Biggs, 1976), with 5% of the performance variance being thus accounted for. Study skills otherwise only appeared in interaction with other variables, as already described.

Another variable which correlates consistently but negatively with performance is academic neuroticism: not surprisingly, students who feel overwhelmed and confused with course demands do poorly. There is a chicken and egg situation here; it not being clear which comes first, the confusion or the poor performance. Nevertheless this would appear to be a useful target for study improvement programmes: if this affective reaction could be reduced, then possibly, even probably, academic performance would improve. At the least, this dimension of the SPQ provides a means of identifying students actually or potentially at risk.

The two meaningful and rote learning dimensions kept constantly reappearing as determinants of academic performance, independently of means of the mode of evaluating performance and very probably independently of the subject area being studied. Rather the determining factors as to which of the two strategies would be successfully utilised were (a) the basic personality genotype of the student, i.e. internal or external, and (b) the not unrelated question of his academic values, i.e. whether he sees university as a means to another end, or as an end in itself.

In short, then, the question of process-product relationships is not a simple one. Certainly there is little evidence to support optimistic generalisations about "the best" methods of studying, whether SQ3R or anything else.

Methodology

Let us now consider questions of methodology. The work described so far has been conceived and carried out using traditional psychometric assumptions, in particular those relating to the unidimensionality of

scales. In the production of the SPQ scales, factor analysis was the most used technique; the reliability of the scales was reported above using Cronbach's alpha. In deriving the scales, a hopefully random sample of the total population is tested; i.e. Arts, Science, males, females, internals, externals, introverts, extraverts, high ability, low ability students, etc. are thrown together, and if these all agree that certain items go together, then eigen values exceed unity, a factor emerges and a scale is borne. Particularly if that scale is replicated several times, then one concludes that this dimension is an important one in the study process domain.

This is certainly all in accord with established practice, but when we look back at the original model (Figure 1), the nasty thought occurs that this unidimensionalising over a diverse population, or R-analysis as Cattell (1966) calls it, might just be masking the very things that one is interested in. Perhaps, in view of the supposed interactions and causal sequences involving personality variables, academic values and attitudes and study strategies, one should be working within, not across, domains, because in the latter it is possible that R-analysis techniques tend to "homogenise out" those very interactions and sequences that one is seeking. The same would apply to other presage domains, such as institutional ones, e.g. enrollment in an Arts or Science course.

A technique that has been used by other writers in this same area is that of cluster analysis. Entwistle and Brennan (1971), for instance, used a programme that picked out students with similar score profiles within certain desired groupings, in their case high attaining and low attaining students. In this way they were able to distinguish three different types of high attaining student:

- (i) male, scientist, high matriculation, high number ability, high motivation, organised study methods and exam technique, tough,

conservative, stable introvert.

- (ii) male, science, high matriculation, high number ability but average motivation and study methods, low SES.
- (iii) female, Arts, high verbal ability, religious, not ambitious, radical.

This would appear to be a useful technique for picking out "types", as was intended, but it says little about connections between the variables nominated; about the combinations that are not nominated as one cannot assume they are all empty cells; or about mapping the process domain itself in the sense of scale construction.

Another possible technique is what Cattell (1966) calls Q-analysis. Instead of, pooling people and finding consistencies among their responses, as in R-analysis, people and responses are transposed: each item is tagged with its "response", i.e. a person with known characteristics (e.g. science, male, high ability), and then the whole matrix is factor analysed to see if the people form consistencies, i.e. the analogue of scales. This procedure was adopted in Biggs (1976), in which the specific hypothesis was tested, using an oblique Procrustes model, that the items would consistently group people to form three factors: general achievement whatever faculty orientation, Arts-unique and Science-unique. This hypothesis was confirmed: the general factor pattern was the first to emerge and the clearest, although faculty specific patterns also existed. The loadings did not differ materially between males and females. This suggested that the SPQ items most easily ordered into a complex internally consistent complex that applied to achievement whatever the subject matter studied, and independently of sex.

The next question of course was to look at the constitution of this complex. Each item's factor score on the three factors was

computed, and those with factor scores exceeding ± 1.3 sigma were identified. It was thus possible to see what kinds of items went together when the specific aim was to distinguish general achievement from faculty specific achievement. The following R-scale items appeared:

Table 2 goes here

The first scale comprises a complex of study skills, lack of anxiety, a degree of academic motivation but an externally oriented stance to academic work. The picture is not unlike one of Entwistle's composites: the well organised, low key, "cool" student, but unlike Entwistle's, this one is equally likely to be male or female or doing his high achieving in Arts or Science. The second scale generates a fairly familiar picture: the nonpragmatic and somewhat disorganized Arts student, with a flexible and open value system, an internal stance and liable to use meaningful learning. The third scale contained a few items from several scales; a clearer picture is given by the individual items. It is not that of the high achieving scientist, but that of an ambitious opportunist who minimises his work load but is conscientious within that minimum: a familiar picture again. There is some clear overlap between the scales in that items were repeated: in fact only 32 items of the original 80 appeared in the three Q versions. It is interesting to note too how, given a specific context, several items loaded in opposite directions, relative to each other, compared to the original R-scales.

The question is: do the Q scales, specifically derived to predict cross-faculty and inter-faculty achievement, predict performance better than the R-scales? A series of stepwise regressions was run and this analysis is reported in Table 3.

	Q1 General Achievement	Q2 Arts	Q3 Science	No. Items	Cronbach's α
Pragmatism		1,-4	2,-1	10	.77
Academic motivation	1		1,-2	10	.69
Academic neuroticism	-3			7	.58
Internality	-1	2	-1	8	.54
Study skills	6	-3	2	8	.70
Rote learning			1	8	.70
Meaningful learning		2	-1	8	.71
Test anxiety	-1		1	6	.82
Openness		2,-1	1	8	.63
Class dependence				7	.50
No. Items	12	15	13		
Cronbach's α	.68	.58	.42		

(A negative prefix (-) means that these items had negative factor scores, and hence are reversed in meaning.)

Table 2: The constitution of the Q-scales (see Appendix B for particular items).

Table 3 goes here

It can be seen that High School Matriculation scores predicted best in all faculties, more so in Science than in Arts. The Q-scales then appear to give a marginally better showing than the conventional R-scales, except in Arts females, where for some reason simple linear prediction is not improved by using any of the SPQ scales. Otherwise, the interesting feature is that the second Q-scale, originally contrived to fit Arts membership, is seen to predict significantly and positively in both Arts males, and Science males and females. The so-called science Q-scale does not appear at all. The Q-scales are clearly misnamed, despite their construction: they refer to two effective general complexes, which seem to comprise the values, attitudes and strategies appropriate to the general internal and external stances referred to earlier, and which are appropriate to performance in either faculty. Thus even when a deliberate attempt to construct faculty specific study processes was made, the resulting scales predicted performance equally well whatever the faculty.

But to return to the methodological issue, the scales derived by Q-analysis seemed economical and logical, within the theory. The problem with Q-analysis is however that it is specific to the groupings in the original derivation: had ethnic origin (e.g. Asian, immigrant, etc.) SES, political attitudes, age, type of schooling, etc. been used, then presumably a different set of Q-scales would have emerged. Somewhat related to this problem is the basic one that Q-analysis is a situational analysis: it does not refer back to the original question in the model concerning causes, moderating variables and effects. It seems that properly to investigate this set of problems quite different methods of analysis will be required; e.g. I have recently

come across path analysis, and this appears at first glance to be a potentially useful method.

Further work

At least three areas requiring further work seem indicated:

1. On the theoretical model

The three-stage presage-process-product model is so far compatible with existing evidence. However, it can hardly be said to have yet been subjected to crucial empirical testing. As indicated above, one of the major difficulties here is methodological more than anything.

2. On changing study processes

The model, and indeed the data obtained so far, suggest that study processes are for the individual a fairly unique resolution of personality variables, attitudes, values and motives, on the one hand, and task and situational demands on the other. Hence the basic irrelevance of courses in basic study skills in changing students' studying processes -- except, and it is an important practical exception, in so far as such courses reduce anxiety and help the student to at least feel that he might be able to cope after all. As we have seen, a fairly universal concomitant of academic neuroticism is poor performance, and if the neuroticism can be reduced then performance may improve.

Changes in study process, then, require something more akin to therapy than to training. The work of Johnson Abercrombie (1969) on small group learning in a medical school, on the one hand, and that of T-groups, in an academic context (e.g. Winter, Griffith and Kolb, 1970), on the other, suggest a small group technique, called here "cognitive confrontation", which appears to have promise for the kind of "therapeutic" task here implied. Cognitive confrontation involves

learning a language so that the student may refer to learning as a process rather than as the acquisition of content; he then compares his learning processes to those of others, through the medium of group interaction with reference to academically relevant content. In this way, it is hoped that this exercise in enforced allocentrism, with the self-insight that would result from this, would lead the student through his own personal causal nexus thus clarifying the links between personality, values, attitudes and resulting study processes. This phase of the research is, however, undeveloped, apart from two pilot projects. However, in both cases, the permissible time available was insufficient for effective group interaction and it is intended to explore this technique further.

3. On the development of the SPQ

Whatever the theoretical or methodological problems, an instrument has emerged from this research which appears to offer a useful and fairly unique set of scales, which might be useful for research and possibly counselling or screening purposes. Two versions are currently available, a senior high school, and university. If further use is to be made of these scales, beyond research pure and simple, then it would be immediately necessary to administer the scale SPQ on a wide and representative scale in order to refine the instrument (e.g. it would be desirable for the sake of convenience to have even numbers of items per scale, say 8) and obtain Australian norms for different school, college and university groups. I am hoping in fact to carry out such work and would be pleased to hear from anyone who would be interested in obtaining data that would be useful for standardisation purposes.

In summary, the research reported here only scratches the surface of what is clearly a highly complex area. We need to go beyond best methods of studying, beyond even the production of questionnaires,

for what is involved here is an attempt to understand what happens when sophisticated learners are faced with complex academic material. I haven't mentioned the additional complication of modes of presenting that material and other aspects of the teaching method itself: with the development of individualised instruction, audio-tapes, student selected modes of evaluation, and the like, it seems important that the design of such developments is keyed into what we know of student study processes.

Perhaps, with this recent emphasis upon self-management and independent learning, it becomes important for all students to obtain some self-insight into their learning/studying processes, perhaps through cognitive confrontation, perhaps in other ways. It seems to me that this should be an important focus for future research in study processes.

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APPENDIX A: R-scales

<u>Loading</u>	<u>Item</u>
<u>1. Pragmatism</u>	
.82	I chose my present courses to enable me to secure a position with a top starting salary and above average earning potential.
.77	I am at university mainly because I feel that I will be able to obtain a better job if I have a university degree.
.70	I want top grades in most or all of my courses so that I will be able to select from among the best positions available when I graduate.
.67	I try to select my courses on the basis of their practical value for my career plans rather than for their academic interest.
.52	I find university more relevant than high school because I am able to study areas which really interest me.
.52	I resent having to spend four years of my life at university but feel that the end results will make this worthwhile.
.50	In choosing between two courses, I put more emphasis on how practical rather than on how interesting a course may be.
.50	I feel that one of the most important considerations in choosing a course is whether or not I will be able to get top marks in it.
.42	I question the value of undergraduate courses which take a theoretical, academic instead of a practical approach.
.42	As long as I do well on the examinations, I don't worry much about the particular content of a course.
<u>2. Academic Motivation</u>	
.67	I find that studying academic topics can at times be as exciting and gripping as reading a good novel.
.65	I find most new topics interesting and often spend extra time trying to obtain more information about them.
.64	I spend a lot of my free time finding out about interesting topics which have been discussed in different classes.
.64	I usually become increasingly absorbed in my work the more I do.

Loading	Item
.61	I feel that virtually any topic can be highly interesting once I get into it.
.51	I find that I have to do enough work on a topic so that I can form my own point of view before I am satisfied.
.41	After I graduate I hope to work at a job which is academically rather than commercially oriented.
.41	I find university more relevant than high school because I am able to study areas which really interest me.
.39	I have a strong desire to excel in all my studies.
.35	I would rather take a difficult, interesting course instead of an easy, uninteresting course.

3. Academic Neuroticism

.73	It is inevitable that at first one's understanding of a subject will be confused, but I find this initial confusion very distressing.
.61	The continual pressure of work, the drive to meet assignment deadlines and the constant competition make my life at university tense and depressing.
.60	I find a new and unfamiliar approach to an already learned topic confusing and depressing.
.60	When writing a term paper, I find that the topic rapidly becomes more and more complex and I have great difficulty in tying up all the loose ends at the finish.
.53	I feel threatened when a lecturer asks me a question or when I am forced to participate in a class seminar.
.49	I think that it is unreasonable for a lecturer to expect a completely original term paper from an undergraduate student.
.37	I rarely keep up to date with suggested readings that are meant to keep pace with the lectures.

4. Internality

.70	"Inner certainty" is more important to me than modifying my views to fit more easily with what other responsible people think.
.54	When I have worked something out for myself and I really believe my view to be sound, I will stick to it if the class or even the lecturer clearly disagree with me.

Loading	Item
.54	I have to be sure of something in my own mind before I will accept it as being valid or true.
.49	While I realize that truth is forever changing as knowledge is increasing, I feel compelled to discover what appears to be the truth at this time.
.48	When I have come to an important conclusion, I feel an overpowering urge to convince other people that it is right.
.44	I believe strongly that my main aim in life is to discover my own philosophy and belief system and to act strictly in accordance with it.
.37	I feel that I might have some power, eventually, to change things in the world that I see now to be wrong.
.36	I find I personally have to see a co-operative venture (say a group project) through to the end rather than delegate responsibility to a colleague.

5. Study Skills

.77	I try to work consistently throughout the term and review regularly when the exams are close.
.75	I try to do all of my assignments as soon as they are assigned.
.67	I keep neat, carefully arranged notes.
.67	After a lecture or lesson I reread my notes to make sure they are legible and that I understand them.
.65	I try to keep up with all of the suggested readings that go with the lectures.
.51	I summarize suggested readings and include these as part of my notes on a topic.
.49	I keep reviewing important topics until I understand them completely.
.46	When a test is returned, I go over it carefully correcting all errors and trying to understand why I made the original mistakes.

6. Rote Learning

.77	I prefer subjects with a lot of factual content to more theoretical kinds of subjects.
.74	I prefer to learn the facts and details about a topic rather than a theoretical understanding of it.

Loading	Item
.56	I find that most class discussions are a waste of time because they usually refer to opinions rather than to hard facts.
.52	I find that the best lecturers work from carefully prepared notes and outline major points neatly on the blackboard.
.46	I prefer a text which lays things out carefully in point form and contains frequent tables and summaries, to one which is written almost entirely in paragraph form.
.42	I think most people can actually learn better when they are given the facts about a topic instead of having to figure them out by themselves.
.38	I learn some things by rote, going over and over them until I know them by heart.
.34	I make a point of studying set readings in detail rather than attempting to cover both required and optional readings.

7. Meaning Assimilation

.78	I try to relate new material, as I am reading it, to previously learned material.
.74	When I am reading fresh material, I try to think of what I already know that is related to it and frame questions on this basis that the new material may answer.
.71	I try to relate what I have learned in one subject to that in another.
.65	In reading new material I often find that I'm continually reminded of material I already know and see the latter in a new light.
.58	While I am studying, I often think of real life situations in which the material that I am learning would be handy, and useful to know.
.48	I try to understand what a lecturer is saying about a new topic rather than taking down all of the details for later study.
.35	When I approach a new piece of reading material, I try to note both the basic factual knowledge it contains and the general theoretical points: I rote learn the former, and think about and chew over the latter until both parts complement each other, and the whole hangs together. (Rate yourself according to whether this is a deliberate and conscious strategy.)
.32	When a lecturer makes a point which I don't understand, I try to question him until I can grasp what he is saying.

Loading	Item
<u>8. Test-anxiety</u>	
.84	Even when I have studied hard for a test, I worry that I may not be able to do well on it.
.79	I worry a lot about how I am going to do when I am studying for a test.
.76	I am discouraged by a poor mark on a test and worry about how I will do on the next test.
.67	I am concerned about how poor results on a test will affect my overall grade in a course.
.60	I worry about what my lecturer will think of me if I do poorly on a test.
.46	I worry that a lecturer will try and trick me on a test even though I know the material well.
<u>9. Openness</u>	
.70	I believe that while at university a student should be exposed to all kinds of political and social viewpoints.
.61	I believe that a lecturer has the right to expound any viewpoint he wishes as long as he is sincere in doing so.
.59	I think that the university should encourage experiments and change in our society.
.48	I believe that a lecturer has the right to critically discuss controversial questions although this may offend some members of his class.
.47	I am quite prepared to find that my university studies will raise more questions than they settle.
.42	I expect that my university studies will change my views about such things as politics, my religion and my philosophy of life.
.39	I think that a university student should be allowed to conduct his life any way he wants to as long as he doesn't interfere with someone else.
.37	I find that I am very interested in trying to understand the point-of-view of other students, especially those from different backgrounds than myself.
.35	I think that one important benefit of my university career will be to give me a more general viewpoint.

Loading	Item
<u>10. Class Dependence</u>	
.76	I am very aware that lecturers and textbook writers know a lot more than I do and so I rely on their judgement rather than on my own.
.66	I would question the statements and ideas of my lecturers only under special circumstances.
.65	I prefer to accept what my lecturers say even though it sometimes means that I have to change my own ideas.
.49	I prefer texts which present a unified point of view and are written by an authority instead of a collection of articles by various authors on a topic.
.47	I take seriously anything that I have been lectured about, or that is in my textbooks, so that I would change my interpretations only on the strongest evidence.
.34	If I like a lecturer, it is easier to learn from him even if his actual teaching isn't all that good.

APPENDIX B: Q-scales

Q1 :

- SS I try to do all my assignments as soon as they are assigned.
- M I have a strong desire to excel in all my studies.
- AN The continual pressure of work, the drive to meet assignment deadlines and the constant competition makes my life at university tense and depressing.
- SS I try to work consistently throughout the term and review regularly when the exams are close.
- AN I rarely keep up to date with suggested readings that are meant to keep pace with the lectures.
- SS After a lecture or lesson I reread my notes to make sure they are legible and that I understand them.
- AN When writing a term paper, I find that the topic rapidly becomes more and more complex and I have great difficulty in tying up all the loose ends at the finish.
- 1 I believe strongly that my main aim in life is to discover my own philosophy and belief system and to act strictly in accordance with it.
- SS I try to keep up with all the suggested readings that go with the lectures.
- SS When a test is returned, I go over it carefully, correcting all errors and trying to understand why I made the original mistakes.
- SS I keep reviewing important topics until I understand them completely.
- TA Even when I have studied hard for a test, I worry that I may not be able to do well on it.

Q2 :

- P In choosing between two courses, I put more emphasis on how practical rather than on how interesting a course may be.
- SS I try to do all of my assignments as soon as they are assigned.
- 1 I have to be sure of something in my own mind before I will accept it as being valid or true.
- M I try to relate what I have learned in one subject to that in another.
- P As long as I do well on the examinations, I don't worry much about the particular content of a course.

- SS After a lecture or lesson I reread my notes to make sure they are legible and that I understand them.
- M In reading new material I often find that I'm continually reminded of material I already know and see the latter in a new light.
- P I am at university mainly because I feel that I will be able to obtain a better job if I have a university degree.
- O I find that I am very interested in trying to understand the point-of-view of other students, especially those from different backgrounds than myself.
- +P I think that a person should specialize in some particular area so that his degree will be more attractive to prospective employers.
- O I think that a university student should be allowed to conduct his life in any way he wants to as long as he doesn't interfere with someone else.
- 1 I feel that I might have some power, eventually, to change things in the world that I see now to be wrong.
- SS When a test is returned, I go over it carefully, correcting all errors and trying to understand why I made the original mistakes.
- P I chose my present courses to enable me to secure a position with a top starting salary and above average earning potential.
- O I believe that a lecturer has the right to critically discuss controversial questions although this may offend some members of his class.

Q3 :

- P In choosing between two courses, I put more emphasis on how practical rather than on how interesting a course may be.
- SS I try to do all of my assignments as soon as they are assigned.
- O I am quite prepared to find that my university studies will raise more questions than they settle.
- AM I have a strong desire to excel in all my studies.
- TA I am discouraged by a poor mark on a test and worry about how I will do on the next test.
- AM I find most new topics interesting and often spend extra time trying to obtain more information about them.
- M When writing a term paper, I find that the topic rapidly becomes more and more complex and I have great difficulty in tying up all the loose ends at the finish.

(ix)

- P I find university more relevant than high school because I am unable to study areas which really interest me.
- P I want top grades in most or all of my courses so that I will be able to select from among the best positions available when I graduate.
- 1 I feel that I might have some power, eventually, to change things in the world that I see now to be wrong.
- SS When a test is returned, I go over it carefully, correcting all errors and trying to understand why I made the original mistakes.
- +R I find that the best lecturers work from carefully prepared notes and outline major points neatly on the blackboard.
- AM I spend a lot of my free time finding out about interesting topics which have been discussed in different classes.

(a) R-scales

Step	Arts				Science			
	Male		Female		Male		Female	
	Pred.	Cum. %	Pred.	Cum. %	Pred.	Cum. %	Pred.	Cum. %
1	HS	23.9	HS	32.1	HS	48.2	HS	60.9
2	- Ac. Neurot.	29.7	-	32.1	+Study Skills	53.0	+Study Skills	67.8
3	-	29.7	-	32.1	-Intern- ality	55.0	- Rote Learn	72.6
4	-	29.7	-	32.1	-	55.0	- Test- Anxiety	74.7

(b) Q-scales

Step	Arts				Science			
	Male		Female		Male		Female	
	Pred.	Cum. %	Pred.	Cum. %	Pred.	Cum. %	Pred.	Cum. %
1	HS	23.9	HS	32.1	HS	48.2	HS	60.1
2	+Achieve	28.6	-	32.1	+Achieve	54.6	+Achieve	68.0
3	+ Arts	32.0	-	32.1	+ Arts	56.3	+ Arts	70.7

Table 3 : Stepwise regressions of High School (HS) and (a) R-scales, (b) Q-scales, on GPA ($p < .05$).

3(a)

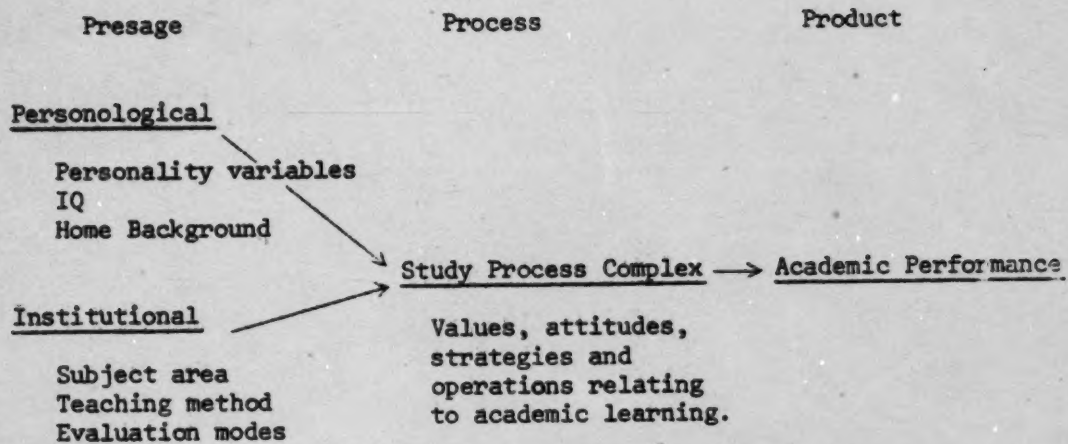


Figure 1 : A model of study processes